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Investigation of Ball Milling Assisted Liquid-Phase Exfoliation of WS_2 Crystals ARJUN DAHAL, Department of Physics, University of South Alabama — With high surface area and exotic electronic properties, WS_2 nanosheets are potentially useful for sensing, catalysis, and energy storage applications. The cost-effective and large-scale production of WS_2 nanosheets is a fundamentally important step for its incorporation in future applications. The liquid phase exfoliation of WS_2 nanosheets from its bulk counterpart using high-intensity ultrasound waves has proven to be a suitable method to produce a high yield of nanosheets. Here, we show that WS_2 nanosheets' yield can be significantly increased if WS_2 crystal is ball-milled prior to the ultrasonication in isopropyl alcohol. We find that the ball milling assisted sonication increases nanosheets' yield by 50% compared to if the bulk crystal is solely ball milled or sonicated. The optical characterization shows the high quality of WS_2 nanosheets with the yield as high as 6.4%. We show that size selected nanosheets, prepared using repeated centrifugation and sedimentation method, are stable with no precipitation formation for more than two months.

Arjun Dahal
Department of Physics, Univ of South Alabama

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